SPALLOGENIC RARE GASES IN IRON METEORITES WITH ISOTOPICALLY ANOMALOUS Ag

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Cosmic-ray produced rare gases have been measured in four meteorites with excess $^{107}Ag^*$ (Kelly and Wasserburg, 1978; Kaiser *et al.*, 1980a, 1980b) to determine if $^{107}Ag^*$ is related to cosmic ray exposure. Kaiser *et al.* (1980a) considered the possibility that $^{107}Ag^*$ could derive from energetic particle reactions on Pd if the cross section times multiplicity for all reactions were $\sim 10^2$ b. However, they noted that relative $^{107}Ag^*$ were inconsistent with published cosmic ray exposure ages. Reedy (1980) estimated the production of ^{107}Ag from Pd and concluded that a cosmic ray bombardment of $\sim 10^9$ yr would probably product at most 1% of $^{107}Ag^*$ observed in Santa Clara and Piñon. To directly compare $^{107}Ag^*$ with spallogenic rare gases produced at the same shielding depth, He, Ne, and Ar were measured in portions sawn from the same small pieces analyzed for Ag. This comparison is not possible using literature data. Two pieces from different locations in Santa Clara and in Piñon were analyzed. These are the first spallogenic gas measurements on Santa Clara. $^4He/^{38}Ar$ *vs.* $^3He/^{21}Ne$ in all four meteorites is in accord with the systematics determined by Signer and Nier (1960) from the Grant iron meteorite. No sample appears to have had an unusual irradiation.

^4He and $^{21}Ne/^4He$ are plotted *versus* $^{107}Ag^*/Pd$ in Figure 1. The content of ^4He is most representative of the total fluence of lower energy particles through the piece analyzed; $^{21}Ne/^4He$ increases with the hardness of the energy spectrum of the particle flux. There is no correlation of $^{107}Ag^*/Pd$ with either the total fluence of energetic particles or the hardness of the particle energy spectrum. The absence of any such correlation is evidence that the $^{107}Ag^*$ in these iron meteorites is not produced by energetic particles capable of producing the spallogenic He and Ne. A quantitative conclusion using published GCR spectral distributions is hampered by the theoretical difficulties in extrapolating from high-ΔA products (Ne, Ar from Fe) to ΔA = 3 (^{107}Ag from ^{110}Pd).

Div. Contrib. No. 3465 (357).

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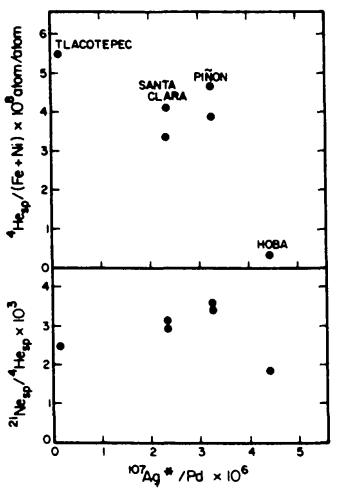

Fig. 1 **(top) ^4He *vs.* $^{107}Ag^*/Pd$. $^{107}Ag^*/Pd$ is not proportional to the fluence of bombarding particles producing ^4He, as shown in the extreme by Hoba and Tlacotepec.**

(bottom) $^{21}Ne/^4He$ *vs.* $^{107}Ag^*/Pd$: If $^{107}Ag^*$ derives from cosmic ray bombardment, $^{107}Ag^*/Pd$ should increase monotonically as $^{21}Ne/^4He$ decreases. Piñon is a clear exception to such a trend.